NICHOLAS SMITH CONNOLLY

Email: nicholas-connolly@uiowa.edu
Personal Website: http://www.nick-connolly.com/
GitHub: https://github.com/Nicholas-Connolly
LinkedIn: https://www.linkedin.com/in/nicholas-connolly-051930182/

EDUCATION

University of Iowa, Iowa City, IA
- PhD in Mathematics — May 2021
- M.S. in Mathematics — May 2018

Kenyon College, Gambier, OH — May 2015
- B.A. in Mathematics and Physics, graduated cum laude
- Minor in Philosophy, concentration in Scientific Computing

RESEARCH EXPERIENCE

PhD Research in Knot Theory — 2018 - present

Location: University of Iowa
Research Advisor: Prof. Isabel Darcy

Research Highlights:
- Developed a new tangle diagram notation using graph theory.
- Implemented programs in C/C++ to construct and classify tangles.
- Translated theoretical constructions to computational algorithms.
- Developed a web accessible database of tangles using HTML, PHP, and MySQL (http://nick-connolly.com/tangles).

NSF-Funded Research with USACE Geospatial Research Laboratory — Summer 2020

Location: Alexandria, VA (remotely)
Project Mentor: Charlotte Ellison, USACE ERDC Researcher

Internship Description:
- Participated through NSF-MSGI Program.
- Project Title: Structure Embedding for Heterogeneous ST Data.
- Worked for 10 weeks as a graduate student research intern.

Research Highlights:
- Developed graph theoretic approach to explore similarities between spatio-temporal trajectories with multi-modal attributes.
- Implemented community detection algorithms using Python.

Machine Learning Internship with UsideU — Summer 2019

Location: Tokyo, Japan
Project Mentor: Dr. Alireza Goudarzi, Chief AI Officer at UsideU

Internship Description:

- Participated through ICC Consultant's Internship in Japan program.
- Worked for 4 weeks on R&D at UsideU's Tokyo office.

Research Highlights:

- Engaged in exploratory data science using Python.
- Automated pattern analysis in time series data using AI.
- Created a neural network to evaluate user data.
- Presented work at ACML 2019 poster session.
- Submitted non-reviewed short paper with accepted poster.

Data Science Internship with Ameren Summer 2019

Location: Ameren Innovation Center, Champaign, IL
Project Mentor: Dr. Gui Maia, Senior Data Scientist at Ameren

Internship Description:

- Participated through UIUC's PI4-IMA Summer Internship Program.
- Completed 12 day computational workshop covering R and Python.
- Worked for 6 weeks as a Digital Intern with Ameren.

Research Highlights:

- Member of Ameren's interdisciplinary Data Science Team.
- Headed project applying computer vision to parse PDF documents.
- Developed algorithm in Python to automate record keeping.
- Delivered internal presentation to Ameren engineers.

Kenyon College Capstone Project in Scientific Computing Spring 2015

Location: Kenyon College
Research Advisor: Prof. Nuh Aydin

Research Highlights:

- Collaborative project continuing research from preceding summer.
- Generalized search algorithms for linear codes using Magma.
- Discovered 62 new binary linear codes, now updated in Online Database of Best Known Linear Codes (http://www.codetables.de/).
- Results published in *Applicable Algebra in Engineering, Communication and Computing*.

Kenyon Summer Science Scholars Program Summer 2014

Location: Kenyon College
Research Advisor: Prof. Nuh Aydin

Research Highlights:

- Focused on the connection between coding theory and algebra.
- Implemented search algorithms for linear codes using Magma.
- Obtained 96 record breaking codes, now updated the Online Database of Best Known Linear Codes (http://www.codetables.de/).
- Delivered contributed talk at the MAA MathFest 2014 conference.
- Results published in *Advances in Mathematics of Communications*.

PUBLICATIONS

N. Aydin, N. Connolly, and J. Murphree, "New binary linear codes from QC codes and an augmentation algorithm", *Applicable Algebra in Engineering, Communication and Computing,* 28(4) 339-350, August 2017, DOI 10.1007/s00200-017-0327-x

N. Aydin, N. Connolly, and M. Grassl, "Some results on the structure of constacyclic codes and new linear codes over GF(7) from quasi-twisted codes", *Advances in Mathematics of Communication*, Vol 11(1), 2017, 245-258, DOI: 10.3934/amc.2017016

NON-REVIEWED PAPERS

N. Connolly and A. Goudarzi, "Using Artificial Intelligence to Automate Body Movement Analysis", non-archival short paper included with accepted poster presentation at ACML 2019 workshop on Statistics & Machine Learning Researchers in Japan https://sites.google.com/view/statsmljapan19/accepted-posters

PUBLIC PRESENTATIONS

Constellations and an Algebraic Planar Diagram Code, doctoral research presentation at the University of Iowa Topology Seminar.	December 2019
Using Artificial Intelligence to Automate Body Movement Analysis, poster presentation at the Asian Conference on Machine Learning 2019 workshop on Statistics & Machine Learning Researchers in Japan; Nagoya, Japan.	November 2019
Exploring Industry as a Pure Mathematician: My Summer as a Data Scientist, given at the University of Iowa Mathematical Biology Seminar.	September 2019
Describing Non-Algebraic Tangles with Graphs, research presentation to department head and colleagues in the University of Iowa topology group.	April 2019
Tabulation and Classification of 2-String Tangles, comprehensive examination, presented at the Mathematical Biology Seminar, student run Topology Seminar, and the Graduate and Undergraduate Student Seminar.	November 2018
Constructing Linear Codes with Record Breaking Parameters, presented at MAA MathFest 2014 conference in Portland, OR.	August 2014

SCHOLARSHIPS, AWARDS, AND CERTIFICATES

University of Iowa Outstanding Teaching Assistant Award	Spring 2020
Engaging Across Cultures professional development certificate	Fall 2019
Kenyon College Distinguished Academic Scholar	Spring 2015

Teaching Experience

Grader for MATH:5010: Abstract Algebra II (first year graduate course) — Spring 2019

Graduate teaching assistant in mathematics at the University of Iowa — 2015 - present

- Spring 2020, MATH:1860: Calculus II
- Fall 2019, MATH:1850: Calculus I
- Spring 2019, MATH:1550: Calculus I (for engineering students)
- Fall 2018, MATH:1120: Logic of Arithmetic (college of education)
- Spring 2018, MATH:1010: Trigonometry (primary instructor)
- Fall 2017, MATH:1010: Trigonometry (primary instructor)
- Summer 2017, MATH:1050: College Algebra
- Spring 2017, MATH:1440: Precalculus (for pre-med students)
- Fall 2016, MATH:1340: Precalculus (for pre-business students)
- Spring 2016, MATH:1460: Calculus I (for pre-med students)
- Fall 2015, MATH:1340: Precalculus (for pre-business students)

General mathematics tutor at the University of Iowa — 2015 - present

Volunteer in six iterations of LADS: Learning and Doing Science, a science outreach program for middle school students hosted at Kenyon College. — 2012 - 2015

Professional Memberships

Society for Industrial and Applied Mathematics	2019 - present
American Mathematical Society	2015 - present
Mathematical Association of America	2014 - present
Sigma Pi Sigma physics honors society	2013 - present
Pi Mu Epsilon mathematics honors society	2013 - present
Sigma Xi scientific research honors society	2015 - 2016
American Physical Society	2014 - 2015

Computer Skills

Basic	**Advanced**	**Fluent**
R, HTML, PHP, Julia, XPPAUT, LabVIEW, MultiSim, Maple	C/C++, Python, MySQL, MATLAB, Mathematica, Origin, Magma	LaTeX